

DEVELOPMENT OF SYNBIOTIC WHEY DRINK

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ABSTRACT

A study was undertaken to prepare synbiotic whey drink using probiotics and honey as prebiotic. The optimum acidity of 0.45 to 0.51 per cent lactic acid was reached by *Bifidobacterium longum* culture in 4hr of incubation. Preliminary screening for selection of culture was done based on acidity and pH development. Acidity and pH development by *Bifidobacterium longum* differed significantly from all other species due to its slow acid production of 0.73 and 0.51 per cent lactic acid at 8hr and 4hr of intervals respectively. For acceptable sour taste of consumer and required level of bifidobacterial load, the performance of probiotic cultures at their log phase was considered crucial. *Bifidobacterium longum* was selected based on acidity and pH developed after 4 hrs of incubation viz 0.51 and 4.83 respectively. It was used for the preparation of synbiotic whey drink using paneer and cheese whey added with honey at 1.5, 2 and 2.5 per cent levels. The probiotic load of 10^8 cfu/ml gives better health benefits when consumed and the maximum count of $8.93 \log_{10}$ cfu/ml was reached in 4 hr of incubation in Synbiotic whey drink with 2 per cent honey..

KEYWORDS: Whey, *Bifidobacterium Longum*, Synbiotic whey Drink & Honey

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INTRODUCTION

Synbiotic whey drink is a fermented milk by-product, with sweet and sour taste. To make it more dietetic whey, probiotic cultures and prebiotic substances were used, for the preparation. (1) Three different Bifidobacterial species were used as probiotics and honey was incorporated as prebiotic.

Whey contains whey proteins, which are very good source of essential amino acids, especially sulphur containing amino acids. They are also very good growth promoters of the probiotic lactic cultures. (2) Biological value, protein efficiency ratio, net protein utilization was high for whey protein, compared to casein.

MATERIALS AND METHODS

Cheese and paneer whey were obtained from whole milk. The whey was partially deproteinised at 78°C for 30 min, and filtered through a muslin cloth. The whey were inoculated with *Bifidobacteria species*, at 2 per cent level and incubated at 37°C for 4–6 h. Then, the prebiotic substance (Honey) was at 1.5 to 2.5 per cent level along with addition of different flavours and colours. (3) The final products were packed in sterile polythene bags and stored at 5°C.

RESULTS

Composition of Cultured Paneer and Cheese Whey

The mean chemical compositions like fat, whey protein, total solids, lactose, total ash, calcium and phosphorus content for bifidobacteria cultured paneer whey were found to be 0.50 ± 0.038 , 0.79 ± 0.012 , 6.07 ± 0.178 , 4.32 ± 0.097 , 0.49 ± 0.066 , 0.28 ± 0.014 and 0.34 ± 0.013 percent, respectively and for cheese whey, the values were 0.58 ± 0.014 , 0.67 ± 0.018 , 6.40 ± 0.143 , 4.60 ± 0.045 , 0.53 ± 0.031 , 0.26 ± 0.009 and 0.34 ± 0.011 percent, respectively. The values were statistically analysed for mean variance, which revealed no significant difference ($P > 0.05$).

Developed Acidity in Paneer and Cheese Whey by Bifidobacterial Species

The developed acidity at 0, 2, 4, 6, 8 h after inoculation of bifidus cultures in paneer and cheese whey, by three species of bifidobacteria and incubated at 37°C anaerobically were estimated. The developed acidity was calculated by subtracting normal acidity, from the total acidity and were furnished in Table 1. The three species of bifidobacteria used were viz. *Bifidobacterium bifidum*, *Bifidobacterium adolescentis*, and *Bifidobacterium longum*. The mean values of developed acidity, as percent lactic acid in cultured paneer and cheese whey were (*B. bifidum* – 0.46, 0.60, 0.74, 0.94, 1.02 and 0.46, 0.63, 0.84, 1.04, 1.17), (*B. adolescentis* – 0.44, 0.53, 0.66, 0.80, 1.16 and 0.66, 0.74, 0.96, 1.10, 1.26) and (*B. longum* – 0.33, 0.45, 0.51, 0.59, 0.73 and 0.43, 0.52, 0.59, 0.77, 0.91). Statistical analysis of the data revealed significant difference at $P \leq 0.01$, between the species and hours. (Figure 1 & 2)

Influence of Bifidobacterial Species on pH of Paneer and Cheese Whey

The pH development at 0, 2, 4, 6, 8 h after inoculation of bifidus cultures in paneer and cheese whey, by three species of bifidobacteria incubated at 37°C anaerobically. The three species of bifidobacteria used were viz. *Bifidobacterium bifidum*, *Bifidobacterium adolescentis*, and *Bifidobacterium longum*. The mean pH values observed after 0, 2, 4, 6, 8 h in cultured paneer and cheese whey were (*B. bifidum* – 5.41, 4.71, 4.22, 4.11 and 5.44, 4.73, 4.33, 4.09, 4.03) (*B. adolescentis* – 5.49, 5.21, 4.72, 4.28, 4.02 and 4.74, 4.33, 4.21, 4.10, 3.97) and (*B. longum* – 5.92, 5.47, 4.83, 4.62, 4.33 and 5.40, 5.21, 4.62, 4.34, 4.27). Statistical analysis of the data revealed significant difference at $p \leq 0.01$ between the species and hours.

Prebiotic Effect of Honey on the Growth of *Bifidobacterium Longum* in Whey Drink

The number of colonies formed by different dilutions of bifidus cultured in paneer and cheese whey, with added honey at 1.5 percent, 2 percent and 2.5 percent (SWD_{1.5}, SWD₂, and SWD_{2.5}) at 0, 2, 4, 6, 8 h of incubation were counted. The mean values of six trials were tabulated as log₁₀ colony forming units per ml (log₁₀ cfu/ml). The log₁₀ cfu/ml were paneer whey (8.65, 8.68, 8.71, 8.59, 8.46) for control, (8.81, 8.81, 8.83, 8.81, 8.75) for SWD_{1.5}, (8.81, 8.84, 8.93, 8.85, 8.83) for SWD₂ and (8.81, 8.74, 8.80, 8.74, 8.69) for SWD_{2.5}. The log₁₀ cfu/ml cheese whey was (8.54, 8.66, 8.69, 8.65, 8.51) for control, (8.72, 8.76, 8.74, 8.82, 8.65) for SWD_{1.5}, and (8.72, 8.83, 8.83, 8.77, 8.72) for SWD₂ and (8.72, 8.68, 8.71, 8.65, 8.54) for SWD_{2.5}. Statistical analysis of the data revealed significant difference at ($p \leq 0.01$), between the treatments and hours.

CONCLUSIONS

The optimum acidity of 0.45 to 0.51 percent lactic acid was reached, by *Bifidobacterium longum* culture in 4hr of incubation. Preliminary screening for selection of culture, was done based on acidity and pH development. Acidity and pH

development by *Bifidobacterium longum* differed significantly, from all other species, due to its slow acid production of 0.73 and 0.51 percent lactic acid at 8hr and 4hr of intervals, respectively.

For acceptable sour taste of consumer and required level of bifidobacterial load, the performance of probiotic cultures at their log phase was considered crucial. *Bifidobacterium longum* was selected, based on acidity and pH developed after 4 hrs of incubation viz 0.51 and 4.83, respectively. It was used for the preparation of synbiotic whey drink, using paneer and cheese whey added, with honey at 1.5, 2 and 2.5 percent levels.

The probiotic load of 10^8 cfu/ml gives better health benefits, when consumed and the maximum count of 8.93 \log_{10} cfu/ml was reached in 4 hr of incubation in SWD₂(5)

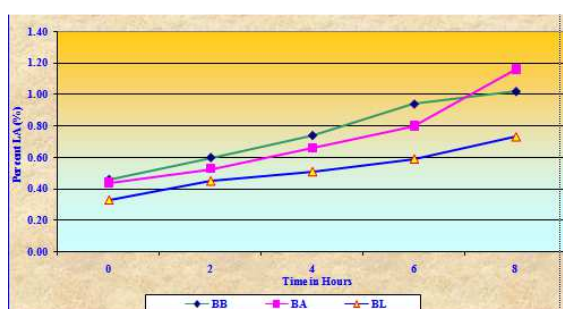


Figure 1: Effect of Three probiotic Cultures on Acid Development of Paneer Whey

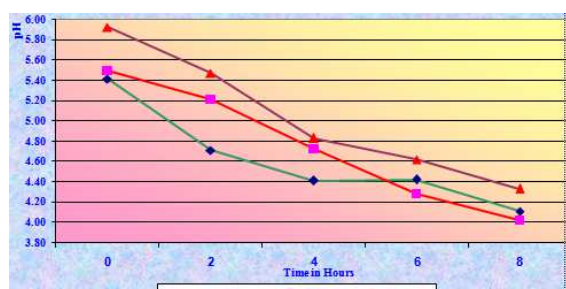


Figure 2: Effect of Three Probiotic Cultures on pH Development of Paneer Whey

Table 1: Developed acidity as per cent Lactic Acid in paneer and cheese whey by bifidobacterial species (37° C)

Culture Organism	Hours of Incubation in Paneer Whey					Hours of Incubation in Cheese Whey				
	0	2	4	6	8	0	2	4	6	8
<i>Bifidobacterium bifidum</i>	0.46	0.60	0.74	0.94	1.02	0.46	0.63	0.84	1.04	1.17
<i>Bifidobacterium adolescentis</i>	0.44	0.53	0.66	0.80	1.16	0.66	0.74	0.96	1.10	1.26
<i>Bifidobacterium longum</i>	0.33	0.45	0.51	0.59	0.73	0.45	0.52	0.59	0.77	0.91
F- value	11.75**					30.74**				
S.E.	0.0467					0.0347				
C.D.	0.1706					0.1267				

Percentages (mean) Average of six trials. Mean values bearing different superscripts are a column differs significantly * * (P < 0.01)

NS - Not Significant

* - Significant

** - Highly Significant

Table 2: Influence of bifidobacterial species of pH of paneer and cheese whey

Culture Organism	Hours of Incubation in Paneer Whey					Hours of Incubation in Cheese Whey				
	0	2	4	6	8	0	2	4	6	8
<i>Bifidobacterium bifidum</i>	5.41	4.71	4.41	4.22	4.11	5.44	4.73	4.33	4.09	4.03
<i>Bifidobacterium adolescentis</i>	5.49	5.21	4.72	4.28	4.02	4.74	4.33	4.21	4.10	3.97
<i>Bifidobacterium longum</i>	5.92	5.47	4.83	4.62	4.33	5.40	5.21	4.63	4.34	4.27
F- value	91.62**					96.57**				
S.E.	0.0542					0.0483				
C.D.	0.1980					0.1762				

Percentages (mean) Average of six trials. Mean values bearing different superscripts in a column differs significantly * * (P < 0.01)

NS - Not Significant

* - Significant

** - Highly Significant

REFERENCES

1. Brandao W & Mendonca S, (2014) *African Journal of Biotechnology* Vol 13(25) 2565-2574
2. Kirsten. E. Bell & Tim Snijders (2017) A whey protein-based multi-ingredient nutritional supplement stimulates gains in lean body mass and strength in healthy older men: controlled trial. *PLoS ONE* 12(7): e0181387. <https://doi.org/10.1371/journal.pone.0181387>
3. Sures Suresh Subramonia B, (2001). *Studies on preparation of dietetic milk powder with added bifidogenic properties*, (Ph.D., Thesis) submitted to Tamilnadu veterinary and Animal Sciences University, Tamilnadu, India
4. Dennis-Wall JC & Culpepper (2017) *TProbiotics (Lactobacillus gasseri KS-13, Bifidobacterium bifidum G9-1, and Bifidobacterium longum MM-2) improve rhinoconjunctivitis-specific quality of life in individuals with seasonal allergies: a double-blind, placebo-controlled, randomized trial. Am J Clin Nutr.* Mar;105(3):758-767.
5. Amal BakrShori(2017) *Microencapsulation Improved Probiotics Survival During Gastric Transit HAYATI Journal of Biosciences* 24(1) 1-5